Rhode Island Department of Elementary and Secondary Education

Spring 2020 Priority Content – Secondary Grades

As both Governor Raimondo and Commissioner Infante-Green have made clear, Rhode Island educators, students, and families have risen to the challenges of distance learning with enviable fortitude. When schools were ordered closed on March 13, educators were asked to forfeit their spring break to prepare for what the public though would be a brief period of distance learning. Resources were few and far between to support educators in preparing for this swift departure from the norm. Nonetheless, LEAs created distance learning plans and educators took steps to reimagine and deliver instruction.

Initial guidance from RIDE included a focus on maintaining previously taught concepts and skills as well as applying those concepts and skills to new situations and thoughtful instruction on new content. When delivering new material, care should be given to do so in small 'chunks' with the recognition that learning remotely may require greater effort and individual/collaborative work time on the part of the student and their family.

The landscape has changed now that RI students and educators will not be returning to the classroom for the 2019-2020 school year. Therefore, additional guidance is necessary to prepare students to successfully engage with new content as they advance to the next grade during the 2020-2021 school year. It is imperative to prioritize the instruction of prerequisite content for this year. Fortunately, much of this content may have already been taught and mastered before the state's shift to distance learning. To support educators in their planning to address this essential prerequisite content, RIDE has identified priority content and standards for ELA, mathematics, science, and social studies.

RIDE has also created an optional planning tool to assist content leaders and educators in identifying which prerequisite content and standards have already been taught, the extent to which they were taught, and which content and standards they need to focus on between now and until the end of the school year. We hope districts will find the tool useful in mapping out instruction, and since the tool is optional, there is no need to submit it to RIDE.

The prioritization of this content and standards is *only* for the distance learning period through June 2020 associated with COVID-19. It is the minimum content educators should incorporate into their instruction during the closing days of the 2019-2020 school year to put students on the path to success for next year.

SIXTH GRADE

English Language Arts Standards

Reading Standards: Literature

RL.1   Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

RL.2   Determine a theme or central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgements.

RL.4   Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of a specific word choice on meaning and tone.

Reading Standards: Informational Text

RI.1   Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

RI.2   Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from person opinions or judgements.

RI.8   Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.

RI.10   By the end of the year, read and comprehend literary nonfiction in the grades 6-8 text complexity band proficiently, with scaffolding as needed at the high end of the range.

Writing Standards

W.4   Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards.)

W.9   Draw evidence from literary or informational texts to support analysis, reflection, and research.

    a.   Apply *grade 6 Reading standards* to literature (e.g., "Compare and contrast texts in different forms or genres [e.g., stories and poems; historical novels and fantasy stories] in terms of their approaches to similar themes and topics").

    b.   Apply *grade 6 Reading standards* to literary nonfiction (e.g., "Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not").

Language Standards

L.1   Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

    a.   Ensure that pronouns are in the proper case (subjective, objective, possessive).

    b.   Use intensive pronouns (e.g., *myself, ourselves).*

    c.   Recognize and correct inappropriate shifts in pronoun number and person.

    d.   Recognize and correct vague pronouns (i.e., ones with unclear or ambiguous antecedents).

    e.   Recognize variations from standard English in their own and others' writing and speaking, and identify and use strategies to improve expression in conventional language.

L.2   Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

    a.   Use punctuation (commas, parentheses, dashes) to set off nonrestrictive/ parenthetical elements.

    b.   Spell correctly.

SEVENTH GRADE

English Language Arts Standards

Reading Standards: Literature

RL.1   Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

RL.2   Determine a theme or central idea of a text and analyze its development over the course of the text; provide an objective summary of the text.

RL.4   Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of rhymes and other repetitions of sounds (e.g., alliteration) on a specific verse or stanza of a poem or section of a story or drama.

Reading Standards: Informational Text

RI.1   Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

RI.2   Determine two or more central ideas of a text and analyze their development over the course of the text; provide an objective summary of the text.

RI.8   Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.

RI.10   By the end of the year, read and comprehend literary nonfiction in the grades 6-8 text complexity band proficiently, with scaffolding as needed at the high end of the range.

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Writing Standards

W.4   Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards.)

W.9   Draw evidence from literary or informational texts to support analysis, reflection, and research.

  a. Apply *grade 7 Reading standards* to literature (e.g., "Compare and contrast a fictional portrayal of a time, place or character and a historical account of the same period as a means of understanding how authors of fiction use or alter history").

  b. Apply *grade 7 Reading standards* to literary nonfiction (e.g., "Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claim").

Language Standards

L.1   Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

  a. Explain the function of phrases and clauses in general and their function in specific sentences.

  b. Choose among simple, compound, complex, and compound-complex sentences to signal differing relationships among ideas.

  c. Place phrases and clauses within a sentence, recognizing and correcting misplaced and dangling modifiers.

L.2   Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

  a. Use a comma to separate coordinate adjectives (e.g., *It was a fascinating, enjoyable movie* but not *He wore an old[,] green shirt).*

  b. Spell correctly.

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RIDE Rhode Island Department of Education

EIGHTH GRADE

English Language Arts Standards

Reading Standards: Literature

RL.1   Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.

RL.2   Determine a theme or central idea of a text and analyze its development over the course of the text, including its relationship to the characters, setting, and plot; provide an objective summary of the text.

RL.4   Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.

Reading Standards: Informational Text

RI.1   Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.

RI.2   Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.

RI.8   Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced.

RI.10 By the end of the year, read and comprehend literary nonfiction at the high end of the grades 6-8 text complexity band independently and proficiently.

Writing Standards

W.4   Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards.)

W.9   Draw evidence from literary or informational texts to support analysis, reflection, and research.

a. Apply *grade 8 Reading standards* to literature (e.g., "Analyze how a modern work of fiction draws on themes, patterns of events, or character types from myths, traditional stories, or religious works such as the Bible, including describing how the material is rendered new").

b. Apply *grade 8 Reading standards* to literary nonfiction (e.g., "Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced").

RIDE Rhode Island Department of Education

Language Standards

L.1   Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

a.   Explain the function of verbals (gerunds, participles, infinitives) in general and their function in particular sentences.

b.   Form and use verbs in the active and passive voice.

c.   Form and use verbs in the indicative, imperative, interrogative, conditional, and subjunctive mood.

d.   Recognize and correct inappropriate shifts in verb voice and mood.

L.2   Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

a.   Use punctuation (comma, ellipsis, dash) to indicate a pause or break.

b.   Use an ellipsis to indicate an omission.

c.   Spell correctly.

NINTH-TENTH GRADE

English Language Arts Standards

Reading Standards: Literature

RL.1   Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

RL.2   Determine a theme or central idea of a text and analyze in detail its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.

RL.4   Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone).

Reading Standards: Informational Text

RI.1   Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

RI.2   Determine a central idea of a text and analyze its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.

RI.8   Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid, and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.

RI.10   By the end of grade 9, read and comprehend literary nonfiction in the grades 9-10 text complexity band proficiently, with scaffolding as needed at the high end of the range.

    By the end of grade 10, read and comprehend literary nonfiction at the high end of the grades 9-10 text complexity band independently and proficiently.

Writing Standards

W.4   Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards.)

W.9   Draw evidence from literary or informational texts to support analysis, reflection, and research.

    a. Apply *grades 9-10 Reading standards* to literature (e.g., "Analyze how an author draws on and transforms source material in a specific work [e.g., how Shakespeare treats a theme or topic from Ovid or the Bible or how a later author draws on a play by Shakespeare]").

    b. Apply *grade 9-10 Reading standards* to literary nonfiction (e.g., "Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning").

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Language Standards

L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

    a. Use parallel structure.

    b. Use various types of phrases (noun, verb, adjectival, adverbial, participial, prepositional, absolute) and clauses (independent, dependent; noun, relative, adverbial) to convey specific meanings and add variety and interest to writing or presentations.

L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

    a. Use a semicolon (and perhaps a conjunctive adverb) to link two or more closely related independent clauses.

    b. Use a colon to introduce a list or a quotation.

    c. Spell correctly.

ELEVENTH-TWELFTH GRADE

English Language Arts Standards

Reading Standards: Literature

RL.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

RL.2 Determine two or more themes or central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to produce a complex account; provide an objective summary of the text.

RL.4 Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone including words with multiple meanings or language that is particularly fresh, engaging, or beautiful (Include Shakespeare as well as other authors).

Reading Standards: Informational Text

RI.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

RI.2 Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.

RI.8 Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in works of public advocacy (e.g., *The Federalist*, presidential addresses).

RI.10 By the end of grade 11, read and comprehend literary nonfiction in the grades 11-CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.

By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11-CCR text complexity band independently and proficiently.

Writing Standards

W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards.)

W.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

a. Apply *grades 11-12 Reading standards* to literature (e.g., "Demonstrate knowledge of eighteenth-, nineteenth- and early-twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics").

b. Apply *grade 11-12 Reading standards* to literary nonfiction (e.g., "Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning [e.g., in U.S. Supreme Court Case majority opinions and dissents] and the premises, purposes, and arguments in works of public advocacy [e.g., *The Federalist*, presidential addresses]").

Language Standards

L.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

a. Apply the understanding that usage is a matter of convention, can change over time, and is sometimes contested.

b. Resolve issues of complex or contested usage, consulting reference (e.g*., Merriam-Webster's Dictionary of English Usage, Garner's Modern American Usage*) as needed.

L.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

a. Observe hyphenation conventions.

b. Spell correctly.

SIXTH GRADE

Mathematics Standards

Ratios and Proportional Relationships	6.RP

Understand ratio concepts and use ratio reasoning to solve problems.

1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*

2. Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is $3/4$ cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."* (Expectations for unit rates in this grade are limited to non-complex fractions.)

3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

   a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.

   b. Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*

   c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means $30/100$ times the quantity); solve problems involving finding the whole, given a part and the percent.

   d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

The Number System	6.NS

Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for $(2/3) \div (3/4)$ and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that $(2/3) \div (3/4) = 8/9$ because $3/4$ of $8/9$ is $2/3$. (In general, $(a/b) \div (c/d) = ad/bc$.) How much chocolate will each person get if 3 people share $1/2$ lb of chocolate equally? How many $3/4$-cup servings are in $2/3$ of a cup of yogurt? How wide is a rectangular strip of land with length $3/4$ mi and area $1/2$ square mi?*

Compute fluently with multi-digit numbers and find common factors and multiples.

2. Fluently divide multi-digit numbers using the standard algorithm.

3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

Apply and extend previous understandings of numbers to the system of rational numbers.

5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

   a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., $-(-3) = 3$, and that 0 is its own opposite.

   b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.

   c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

8. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

Expressions and Equations   6.EE

Apply and extend previous understandings of arithmetic to algebraic expressions.

1. Write and evaluate numerical expressions involving whole-number exponents.

2. Write, read, and evaluate expressions in which letters stand for numbers.

   a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as $5 - y$.*

   b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression $2 (8 + 7)$ as a product of two factors; view $(8 + 7)$ as both a single entity and a sum of two terms.*

   c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas $V = s^3$ and $A = 6 s^2$ to find the volume and surface area of a cube with sides of length $s = 1/2$.*

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3. Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.*

4. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.*

Reason about and solve one-variable equations and inequalities.

5. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

7. Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.

Represent and analyze quantitative relationships between dependent and independent variables.

9. Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.*

Geometry   6.G

Solve real-world and mathematical problems involving area, surface area, and volume.

1. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

Statistics and Probability   6.SP

Summarize and describe distributions.

5. Summarize numerical data sets in relation to their context, such as by:

   a. Reporting the number of observations.

   b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

   c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall

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pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.

    d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

SEVENTH GRADE

Mathematics Standards

Ratios and Proportional Relationships   7.RP

Analyze proportional relationships and use them to solve real-world and mathematical problems.

1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks ½ mile in each ¼ hour, compute the unit rate as the complex fraction ½/¼ miles per hour, equivalently 2 miles per hour.*

2. Recognize and represent proportional relationships between quantities.

    a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

    b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

    c. Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.*

    d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where r is the unit rate.

3. Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

The Number System   7.NS

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

    a. Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.*

    b. Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its

           opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.

    c.   Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

    d.   Apply properties of operations as strategies to add and subtract rational numbers.

2.   Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

    a.   Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

    b.   Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.

    c.   Apply properties of operations as strategies to multiply and divide rational numbers.

    d.   Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

3.   Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.)

Expressions and Equations   7.EE

Use properties of operations to generate equivalent expressions.

1.   Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

2.   Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."*

Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

3.   Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a 10% raise, she will make an additional $1/10$ of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar $9\,3/4$ inches long in the center of a door that is $27\,1/2$ inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.*

4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

   a. Solve word problems leading to equations of the form $px + q = r$ and $p(x+q)=r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*

   b. Solve word problems leading to inequalities of the form $px+q>r$ or $px+q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.*

Geometry   7.G

Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

4. Know the formulas for the area and circumference of a circle and solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

6. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Statistics and Probability   7.G

Investigate chance processes and develop, use, and evaluate probability models.

5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around ½ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

   a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.

   b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event.

   c. Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?*

EIGHTH GRADE

Mathematics Standards

Expressions and Equations	8.EE

Work with radicals and integer exponents.

1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.*

2. Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.

Understand the connections between proportional relationships, lines, and linear equations.

5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*

Analyze and solve linear equations and pairs of simultaneous linear equations.

7. Solve linear equations in one variable.
   a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers)
   b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

8. Analyze and solve pairs of simultaneous linear equations.
   a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
   b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.*
   c. Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.*

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Functions   8.F

Define, evaluate, and compare functions.

1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (Function notation is not required in Grade 8.)

2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*

3. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.*

Use functions to model relationships between quantities.

4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

5. Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Geometry   8.G

Understand congruence and similarity using physical models, transparencies, or geometry software.

2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

Understand and apply the Pythagorean Theorem.

7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

Statistics and Probability   8.SP

Investigate patterns of association in bivariate data.

3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*

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High School: By Conceptual Category

Mathematics Standards

Conceptual Category: Number and Quantity [N]

The Real Number System	N-RN

Extend the properties of exponents to rational exponents.

1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})3 = 5 (1^{/3})^3$ to hold, so $(5^{1/3})^3$ must equal 5.*

2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Conceptual Category: Algebra [A]

Seeing Structure in Expressions	A-SSE

Interpret the structure of expressions.

1. Interpret expressions that represent a quantity in terms of its context.

   a. Interpret parts of an expression, such as terms, factors, and coefficients.

   b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret $P(1 + r)^n$ as the product of P and a factor not depending on P.*

Write expressions in equivalent forms to solve problems.

3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

   a. Factor a quadratic expression to reveal the zeros of the function it defines.

   b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

   c. Use the properties of exponents to transform expressions for *exponential functions. For example, the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*

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Arithmetic with Polynomials and Rational Expressions   A-APR

Perform arithmetic operations on polynomials.

    1   Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, multiplication; add, subtract, and multiply polynomials.

Understand the relationship between zeros and factors of polynomials.

    3.   Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

Creating Equations*   A-CED

Create equations that describe numbers or relationships.

    1.   Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*

    2.   Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

    3.   Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*

    4.   Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance, R.*

Reasoning with Equations and Inequalities   A-REI

Solve equations and inequalities in one variable.

    3.   Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

    4.   Solve quadratic equations in one variable.

        a.   Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.

        b.   Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula, and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.

Solve systems of equations.

    6.   Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

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Represent and solve equations and inequalities graphically.

10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). Show that any point on the graph of an equation in two variables is a solution to the equation.

11. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*

12. Graph the solutions of a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set of a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Conceptual Category: Functions [F]

Interpreting Functions	**F-IF**

Understand the concept of a function and use function notation.

1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).

2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. For example, given a function representing a car loan, determine the balance of the loan at different points in time.

Interpret functions that arise in applications in terms of the context (linear, quadratic, exponential, rational, polynomial, square root, cube root, trigonometric, logarithmic).

4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*

6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.*

Analyze functions using different representations.

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

    a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

    b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

    c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

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    d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

    e. Graph exponential and logarithmic functions, showing intercepts and end behavior and trigonometric functions, showing period, midline, and amplitude.

8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

    a. Use the process of factoring and/or completing the square in quadratic and polynomial functions, where appropriate, to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

    b. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)12^t$, and $y = (1.2)^t/10$, and classify them as representing exponential growth or decay.*

9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions. *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*

Building Functions   F-BF

Build a function that models a relationship between two quantities.

1. Write a function that describes a relationship between two quantities.*

    a. Determine an explicit expression, a recursive process, or steps for calculation from a context.

    b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the mode*l.

    c. (+) Compose functions. *For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.*

2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.*

Build new functions from existing functions.

3. Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. (Include linear, quadratic, exponential, absolute value, simple rational and radical, logarithmic and trigonometric functions.) Utilize technology to experiment with cases and illustrate an explanation of the effects on the graph. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

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Linear, Quadratic, and Exponential Models*   F-LE

Construct and compare linear, quadratic, and exponential models and solve problems.

1. Distinguish between situations that can be modeled with linear functions and with exponential functions.

   a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

   b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

   c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (including reading these from a table).

3. Observe, using graphs and tables, that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

Trigonometric Functions   F-TF

Model periodic phenomena with trigonometric functions.

5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.*

Conceptual Category: Geometry [G]

Congruence   G-CO

Experiment with transformations in the plane.

1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

2. Represent transformations in the plane using, e.g., transparencies and geometry software describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).

5 Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

Similarity, Right Triangles, and Trigonometry   G-SRT

Understand similarity in terms of similarity transformations.

1. Verify experimentally the properties of dilations given by a center and a scale factor:

    a. A dilation takes a line not passing through the center of the dilation to a parallel line and leaves a line passing through the center unchanged.

    b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.

Prove theorems involving similarity.

4. Prove theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.*

Define trigonometric ratios and solve problems involving right triangles.

6. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

7. Explain and use the relationship between the sine and cosine of complementary angles.

8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.*

Circles   G-C

Find arc lengths and areas of sectors of circles.

5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

Expressing Geometric Properties with Equations   G-GPE

Use coordinates to prove simple geometric theorems algebraically.

4. Use coordinates to prove simple geometric theorems algebraically including the distance formula and its relationship to the Pythagorean Theorem. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point $(1,\sqrt{3})$ lies on the circle centered at the origin and containing the point (0, 2).*

5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

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Geometric Measurement and Dimension   G-GMD

Explain volume formulas and use them to solve problems.

1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*

3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.*

Modeling with Geometry   G-MG

Apply geometric concepts in modeling situations.

1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).*

Conceptual Category: Statistics and Probability [S]

Interpreting Categorical and Quantitative Data   S-ID

Summarize, represent, and interpret data on a single count or measurement variable

1. Represent data with plots on the real number line (dot plots, histograms, and box plots).

2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Summarize, represent, and interpret data on two categorical and quantitative variables.

5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

   a. Fit a linear function to the data and use the fitted function to solve problems in the context of the data. Use functions fitted to data or choose a function suggested by the context. Emphasize linear and exponential models.

   b. Informally assess the fit of a function by plotting and analyzing residuals.

   c. Fit a linear function for a scatter plot that suggests a linear association.

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Interpret linear models.

7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

8. Compute (using technology) and interpret the correlation coefficient of a linear fit.*

9. Distinguish between correlation and causation.

Making Inferences and Justifying Conclusions	S-IC

Understand and evaluate random processes underlying statistical experiments. Use calculators, spreadsheets, and other technology as appropriate.

1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

MIDDLE SCHOOL SCIENCE PERFORMANCE EXPECTATIONS

LIFE SCIENCE

Life: Cells to Organisms

MS-LS1-2 Cell Parts and Function Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

MS-LS1-3 Interacting Body Systems Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

Matter and Energy in Life

MS-LS1-7 Food and Chemical Reactions Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

MS-LS2-3 Matter Cycling and Energy Flow in Ecosystems Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

Heredity, Growth, and Development

MS-LS3-1 Mutations - Harmful, Beneficial or Neutral Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

Natural Selection

MS-LS4-4 Natural Selection Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.

EARTH & SPACE SCIENCE

Space Systems

MS-ESS1-1 Earth-Sun-Moon System Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

History of Earth

MS-ESS2-2 Geoscience Processes at Varying Scales Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

MS-ESS2-3 Evidence of Plate Tectonics Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

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Earth's Systems

MS-ESS2-1 [Cycling of Earth's Materials](#) Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

Weather and Climate

MS-ESS3-5 [Causes of Global Warming](#) Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

PHYSICAL SCIENCE

Matter: Structure and Properties

MS-PS1-1 [Atomic Composition Model](#) Develop models to describe the atomic composition of simple molecules and extended structures.

MS-PS1-4 [Thermal Energy and Particle Motion](#) Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

Forces and Interactions

MS-PS2-2 [Forces, Mass and the Motion of an Object](#) Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

MS-PS2-3 [Electric and Magnetic Forces](#) Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

Energy

MS-PS3-1 [Kinetic Energy of an Object](#) Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

MS-PS3-2 [Potential Energy of the System](#) Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

MS-PS3-5 [Energy Transfer to or from an Object](#) Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

Waves and Information

MS-PS4-2 [Wave Reflection, Absorption, and Transmission](#) Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

HIGH SCHOOL SCIENCE PERFORMANCE EXPECTATIONS

BIOLOGY

Molecules to Organisms

HS-LS1-1 Genes, Proteins, and Tissues Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

HS-LS1-2 Interacting Body Systems Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Inheritance and Variation

HS-LS1-4 Cellular Division and Differentiation Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

HS-LS3-1 Chromosomal Inheritance Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

HS-LS3-2 Inheritable Genetic Variation Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

Matter and Energy in Life

HS-LS1-7 Cellular Respiration and Energy Transfer Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

HS-LS2-5 Cycling of Carbon in Ecosystems Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

Ecosystems

HS-LS2-1 Carrying Capacity of Ecosystems Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

HS-LS2-2 Biodiversity and Populations in Ecosystems Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-LS2-6 Ecosystem Dynamics, Functioning, and Resilience Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

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Natural Selection and Evolution

HS-LS4-2 [Four Factors of Natural Selection](#) Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

HS-LS4-4 [Natural Selection Leads to Adaptation](#) Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

HS-LS4-5 [Environmental Change - Speciation and Extinction](#) Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

CHEMISTRY

Matter: Structure and Properties

HS-PS1-1 [Valence Electrons and Properties of Elements](#) Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.

HS-PS1-3 [Electrical Forces and Bulk Scale Structure](#) Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

HS-PS2-6 [Molecular-Level Structure of Designed Materials](#) Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Chemical Reactions

HS-PS1-2 [Simple Chemical Reactions](#) Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.

HS-PS1-4 [Total Bond Energy Change in Chemical Reactions](#) Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

HS-PS1-7 [Conservation of Atoms in Chemical Reactions](#) Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

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PHYSICS

Forces and Interactions

HS-PS2-2 Conservation of Momentum Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

HS-PS2-4 Gravitational and Electrostatic Forces Between Objects Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

Energy

HS-PS3-1 Energy Change in Components of a System Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

HS-PS3-4 The Second Law of Thermodynamics Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system second law of thermodynamics).

Waves and Information

HS-PS4-1 Wave Properties in Various Media Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

HS-PS4-5 Waves and Information Technology Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

EARTH & SPACE SCIENCE

Space Systems

HS-ESS1-4 Orbital Motions Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

History of Earth

HS-ESS1-5 Evidence of Plate Tectonics Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.

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Earth's Systems

HS-ESS2-2 Feedback in Earth's Systems Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

HS-ESS2-6 Carbon Cycling in Earth's Systems Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

Weather and Climate

HS-ESS3-5 Climate Change and Future Impacts Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

Human Sustainability

HS-ESS3-3 Biodiversity, Natural Resources, and Human Sustainability Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

HS-ESS3-6 Human Impacts on Earth Systems Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

Social Studies (6-8)

This grade level includes all performance indicators for the grade span (6-8) in order to reflect the flexibility of when proficiencies are met (and GSEs are taught) within that grade span according to local curricular decisions. For more information about the inclusion of the *Social Studies Graduation Proficiencies and Performance Indicators for Rhode Island*, please download this short document.

Grade Span	Proficiency #1: History	Proficiency #2: Geography	Proficiency #3: Civics & Government	Proficiency #4: Economics
In grades **6-8**, students will…	Analyze factors of historical or current events from different perspectives using evidence. (HP1,2,4)	Analyze the value of using different geographic representations to compare the major regions of the Earth and their major physical features and political boundaries. (G1)	Compare and contrast different forms of government and assess what happens when political structures do or do not meet the needs of people. (C&G 1-1)	Research and analyze how individuals and societies make choices to address the challenges and opportunities of scarcity and abundance. (E1)
	Construct an historical narrative in chronological order by working backward from some issue, problem, or event to explain its origins and its development over time. (HP2,3)	Using geographical concepts, skills, and tools, describe human and physical characteristics of place and explain how and why they may change over time. (G2)	Analyze the interrelationship among the three branches of government. (G&G 2-1)	Describe the impact producers and consumers have locally, nationally, and internationally as they engage in the exchange of goods and services. (E2)
	Analyze a human issue from its inception, to its impact(s) and future implications, including personal connections, alternative courses of action, ethical considerations, and long- and short-term consequences. (HP3)	Analyze the ways humans interact, adapt, and change their environment in places and regions and the cultural impact. (G4)	Evaluate and defend a position on an issue involving democratic principles, individual rights, or civic responsibilities and propose solutions or a plan to resolve the issue. (C&G 3-1, 3-2)	Explain the cyclical relationship of the participants within an economy (e.g., barter, feudal society, global economy). (E3)
	Analyze the factors, including the influence of technologies an innovations, that influenced the perspectives of people in history and led them to interpret the same events differently. (CCSS. RH.6; HP4)	Explain how the movement of humans, resources and ideas impact the cultural characteristics and the physical resources of places. (G3)	Engage in the political process by expressing and defending informed opinions to an audience beyond the classroom. (C&G 4-2)	
	Analyze how human societies and cultures develop and change in response to human needs and wants. (HP5)	Justify how regional cultures ignite cooperation and conflict, leading to the physical, natural, human, or cultural division and control of the Earth's surface historically and in the present. (G2,3)	Explain how people are politically, economically, environmentally, militarily, and/or diplomatically connected (e.g., World Bank, UN, NATO, EU). (C&G 5-1)	

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Social Studies (9-12)

This grade level includes all performance indicators for the grade span (9-12) in order to reflect the flexibility of when proficiencies are met (and GSEs are taught) within that grade span according to local curricular decisions. For more information about the inclusion of the *Social Studies Graduation Proficiencies and Performance Indicators for Rhode Island*, please download this short document.

Grade Span	Proficiency #1: History	Proficiency #2: Geography	Proficiency #3: Civics & Government	Proficiency #4: Economics
In grades **9-12**, students will…	Analyze the forces of continuity and change in the community, Rhode Island, the US, and the world, applying knowledge of major eras, turning points, historic influences and enduring themes. (HP1,2,5)	Analyze the spatial organization of people, places, and environments on the Earth's surface using geographic tools and technologies. (G1)	Evaluate the purpose and limitations of the foundations, structures, and functions of government. (C&G 1-1,1-2)	Apply economic concepts to analyze how they relate to economic conditions or issues of individuals and groups both globally and locally. (E1-3)
	Analyze how a historical development has contributed to current social, economic, or political patterns. (HP3)	Apply geographical concepts, skills, and tools to examine the human-made and physical characteristics of places to interpret the past, address the present, and plan for the future. (G2)	Analyze how actions of a government affect relationships between individuals, society, and the government. (C&G 1-2)	Analyze the similarities and differences between economic systems in a variety of regions and groups including Rhode Island, the U.S., and the world. (E3)
	Synthesize information to convey how the past frames the present and make personal connections in an historical context. (HP3)	Contextualize the impact of how humans react, adapt, and modify their physical environment and its role in developing culture and society. (G3,4)	Evaluate current issues by applying the democratic ideals in the founding documents and constitutional principles of the U.S. government, and explain how and why democratic institutions and interpretations of democratic ideals have changed over time. (C&G 2)	Analyze the relationship over time between a region's economic system and its government with respect to costs and benefits resulting from real-world choices. (E1,3)
	Evaluate the beneficial and detrimental effects of technology and innovation on society. (HP4)	Analyze the movement between humans and environmental systems, and evaluate the distribution of people, resources, and ideas, both globally and locally over time. (G3)	Evaluate and defend positions regarding personal and civic responsibilities of individuals, using provisions in seminal documents (e.g., *Bill of Rights, Universal Declaration of Human Rights*). (C&G 3-1)	
	Critique the role and contribution of various cultural elements in creating diversity in a society. (HP5)	Evaluate the defining characteristics and interactions of various groups of people both globally and locally over time (including Rhode Island, and Native Americans) to explain how different regions of the world are organized. (G2)	Compare and evaluate various forms of government and political systems in the U.S. and the world, and describe their impact on societal issues, trends, and events. (C&G 4,5)	

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